

TWO NEW SPECIES OF *ACANTHOCHITONA* FROM THE NEW WORLD (POLYPLACOPHORA: CRYPTOPLACIDAE)

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A systematic revision of the New World Cryptoplacidae has revealed the presence of two new species: *Acanthochitona imperatrix* (*commanding chiton*) from tropical west America and *Acanthochitona andersoni* from southeast Florida and the Caribbean. Because of the widespread confusion in the literature concerning this family, additional notes on related species have been extracted from the revision to help clarify the taxonomic position of the species involved.

Abbreviations used in the text:

AMNH—American Museum of Natural History, New York.
ANSP—Academy of Natural Sciences of Philadelphia.
DMNH—Delaware Museum of Natural History, Greenville.
MCZ—Museum of Comparative Zoology, Harvard University.
USNM—U.S. Museum of Natural History, Washington, D.C.

Acanthochitona imperatrix new species

(Plate 1a, b, c; Plate 4b)

Description: Holotype 8.9 mm in length, curled. Tegmentum of intermediate valves about twice as wide as long, flattened, not carinate. Beaks prominent. Jugum very wide, flat, smooth, and distinctly raised above the latero-pleural areas. Jugal macresthetes widely spaced, arranged in longitudinal rows, each associated with 0-2 micresthetes. Latero-pleural areas sculptured with numerous teardrop-shaped, close-set pustules, each moderately elevated and concave. Each pustule bears one centrally located macresthete. 0-5 micresthetes (commonly 0) accompany each macresthete and are generally confined to the area anterior to

the macresthete. Mucro central and prominent with a concave postmucronal slope. Tegmentum uniformly peach-colored, the jugum lighter. Alternating spots of cream and maroon occur along the posterior borders of the valves and flank the jugum on the holotype.

Apophyses extensive. Slit formula 5-1-2. Articulamentum colored cream, tinged with green towards the beaks.

The dorsum of the girdle is velvety, armed with dense, very minute spicules. These spicules are monomorphic (i.e. - composed of one type of element as opposed to bimorphic, composed of two distinct types of elements), round in cross-section, smooth, and slightly bent. Girdle dorsum peach-colored, ventral side slightly darker. Marginal fringe and sutural tufts well-developed, composed of numerous long, slender spicules.

Type locality: 8 fathoms (14.6 m) off San Diego, California; lat. 24°22'30" S, long. 110°19'30" W; taken with tangles on broken shell bottom, April 30, 1888, by the U.S. Fish Commission. *Holotype:* USNM 218762. *Paratypes:* USNM 225346 - Sta. 2826, 9.5 fathoms (17.4 m) off La Paz, Baja California Sur; lat. 24°12'00" S, long. 109°55'00" W; taken with oyster dredge on shelly bottom, April 30, 1888, by the U.S. Fish Commission. ANSP 153484 -Seymour Bay, Isla Santa Cruz (Indefatigable Island), Galápagos Islands, by Pinchot Expedition, Pillsbry.

Range: Subtidally to at least 17 m, from southern California to the Galápagos Islands.

Remarks: A. G. Smith and Ferreira (1977) illustrated and described a specimen of this species (ANSP 153484) but did not name it. Their specimen was composed of a head, tail, and three intermediate valves without the girdle. The specimen is labeled as "*A. galapagana* Pils. MS, A. G. Smith TYPE". This name was

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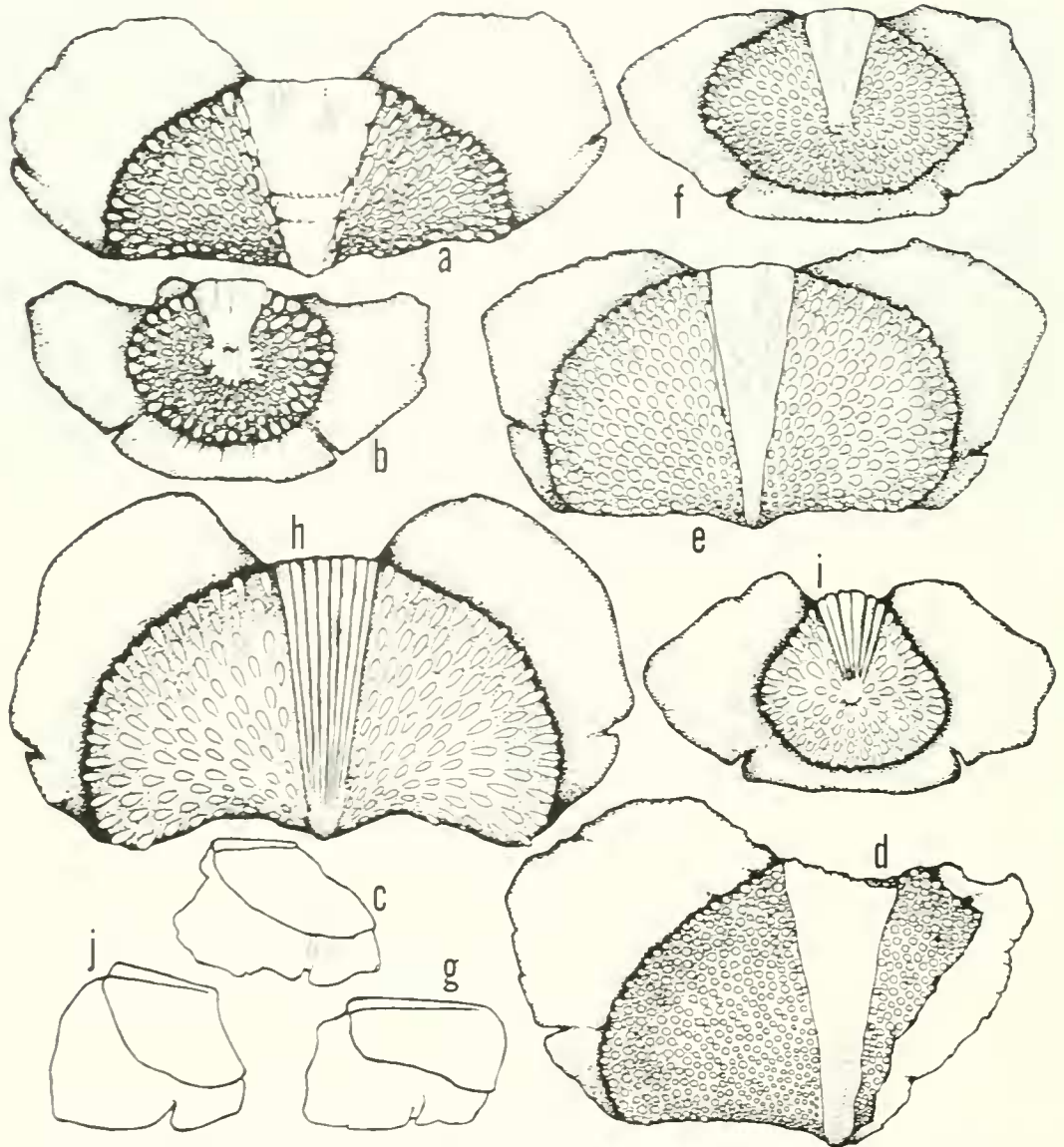


PLATE 1. Figs. a, b, and c: *Acanthochitona imperatrix* new species, Paratype ANSP 153484, Seymour Bay, I. de Santa Cruz, Galápagos Islands. (a), valve ? VII, 3.9 mm diameter. (b), valve VIII, 2.8 mm diameter. (c), valve VIII, profile. Figs. d: *Acanthochitona conmaris* (Rosso, 1926), USNM 218733, Tierra del Fuego, Argentina; (e), valve VII, 5.2 mm diameter. Figs. e, f, and g: *Acanthochitona angelica* Dall, 1919, AMNH 74713, Maria Magdalena Island, Tres Marias Islands. (e), valve VII, 3.8 mm diameter. (f), valve VIII, 2.7 mm diameter. (g), valve VIII, profile. Figs. h, i, and j: *Acanthochitona avicula* (Carpenter, 1864), AMNH 130977, Agua de Chale, Isla de Chilo, Chile. (h), valve VII, 3.2 mm diameter. (i), valve VIII, 2.3 mm diameter. (j), valve VIII, profile.

to the original author and Dr. Ferreira (written communication) together with it. Subsequently I located two other specimens at the U.S. National Museum (nos. 218730 and 218762), the latter of which I designated as holotype.

Acanthochitona imperatrix is one of several species in a New World complex composed of forms characterized by broad, rectangular, intermediate valves bearing teardrop-shaped pustules and a centrally located, prominent

muco. In addition to *A. imperatrix*, the complex contains *A. angelica* Dall, 1919, *A. avicula* (Carpenter, 1864), *A. communis* (Risso, 1826), and *A. spiculosa* (Reeve, 1847). A second complex, composed of *A. astriger* (Reeve, 1847), *A. exquisita* (Pilsbry, 1893a), *A. hemphilli* (Pilsbry, 1893a) (*rhodea* (Pilsbry, 1893a) is this species), *A. hirudiniformis hirudiniformis* (Sowerby, 1832) (*coquimboensis* (Leloup, 1941a) and *taboensis* A. G. Smith, 1961, are this species), and *A. hirudiniformis peruviana* (Leloup, 1941a), is differentiated by having long, pentagonal valves, oval to teardrop-shaped pustules, and a low, posteriorly acentric muco. The third New World complex will be discussed under the following remarks of *Acanthochitona andersoni* new species.

The superspecies that contains *A. imperatrix* antedates the closing of the western Tethys Sea and probably stems from *A. communis* or its immediate ancestor. *Acanthochitona communis* (pl. 1d; pl. 4a) is a widely distributed species throughout the Mediterranean, the eastern Atlantic from Spain to Great Britain and the Azores (Malatesta, 1962), the Cape of Good Hope and the Falkland Islands (Leloup, 1941a), Tierra del Fuego (USNM 218733), and the southern Caribbean (as *A. bonairensis* Kaas, 1972). The dorsal girdle elements of *A. communis* are bimorphic while those of *A. imperatrix* are monomorphic; furthermore, *A. communis* does not possess the very wide, flat, distinctly raised jugum of *A. imperatrix*.

Acanthochitona angelica Dall, 1919, (pl. 1e, f, g; pl. 4e) differs in having bimorphic girdle elements, both of which are bent and striated; those of *A. imperatrix* are straight and smooth. The jugum of *A. angelica* may be longitudinally striated and is never as wide as in *A. imperatrix*. A. G. Smith (1977) inexplicably synonymized *A. angelica* with *A. avicula* despite obvious differences between the two species and *A. angelica* has not been recognized as distinct in recent years (Putnam, 1980, and Kaas and Van Belle, 1980). The dorsum of the girdle of *A. angelica* is velvety, composed of minute spicules, while those of *A. avicula* are coarse and thorn-like. In addition, the pustules of *A. angelica* are never as large and elongated as

those of *A. avicula*. A. G. Smith and Ferreira (1977) introduced *A. jacuelinae*, a synonym of *A. angelica*.

Acanthochitona avicula (Carpenter, 1864) (pl. 1h, i, j; pl. 4c, d) differs from *A. imperatrix* in possessing a striated jugum and large, bent, distally striated spicules among the smaller, smooth elements on the dorsum of the girdle. *Acanthochitona avicula* variety *diegoensis* (Pilsbry, 1893b) is a common variant; the lectotype, herein designated, is ANSP 349330 from San Diego, California (pl. 4d).

Acanthochitona spiculosa (Reeve, 1847) (pl. 2a, b, c; pl. 4f, g) from the Caribbean and southeastern U.S. also has a striated jugum and bent dorsal elements. The *A. pygmaea* of Abbott (1954, 1974), Kaas (1972), Warmke and Abbott (1964), Kaas and Van Belle (1980), and others, is *A. spiculosa*. *Acanthochitona pygmaea* (Pilsbry, 1893b) is based upon a juvenile of *A. spiculosa*; the lectotype, herein designated, is ANSP 35783 from Key West, Florida (pl. 4g). The "*spiculosa*" of these same authors (and of most collections) is *A. astriger*, a common West Indian species which has been confused with *A. spiculosa* ever since E. A. Smith (1890) first misidentified his specimens. *Acanthochitona astriger* (pl. 2d; pl. 4h) never possesses a striated jugum and has longer, more pentagonal valves than *A. spiculosa*. The complicated synonymy of these two species will be presented at a later time.

Synonymy:

Acanthochitona species? A. G. Smith and Ferreira, 1977. *Viliger* 20:82, 97, fig. 22.

Acanthochitona andersoni new species

(Plate 2e, f, g; Plate 4i)

Description: Maximum size 12 mm in length. Tegmentum of intermediate valves longer than wide, pentagonal in outline. Beaks prominent. Jugum wide, smooth except for growth lines. Jugal macresthetes widely and irregularly placed, generally absent from the central portion of the jugum. Each macresthete is accompanied by 1-5 micresthetes. Muco posteriorly acentric, very prominent; postmucronal slope steep and concave. Lateropleural areas sculptured with widely spaced, convex, "D"-shaped pustules which radiate from the beak. Each

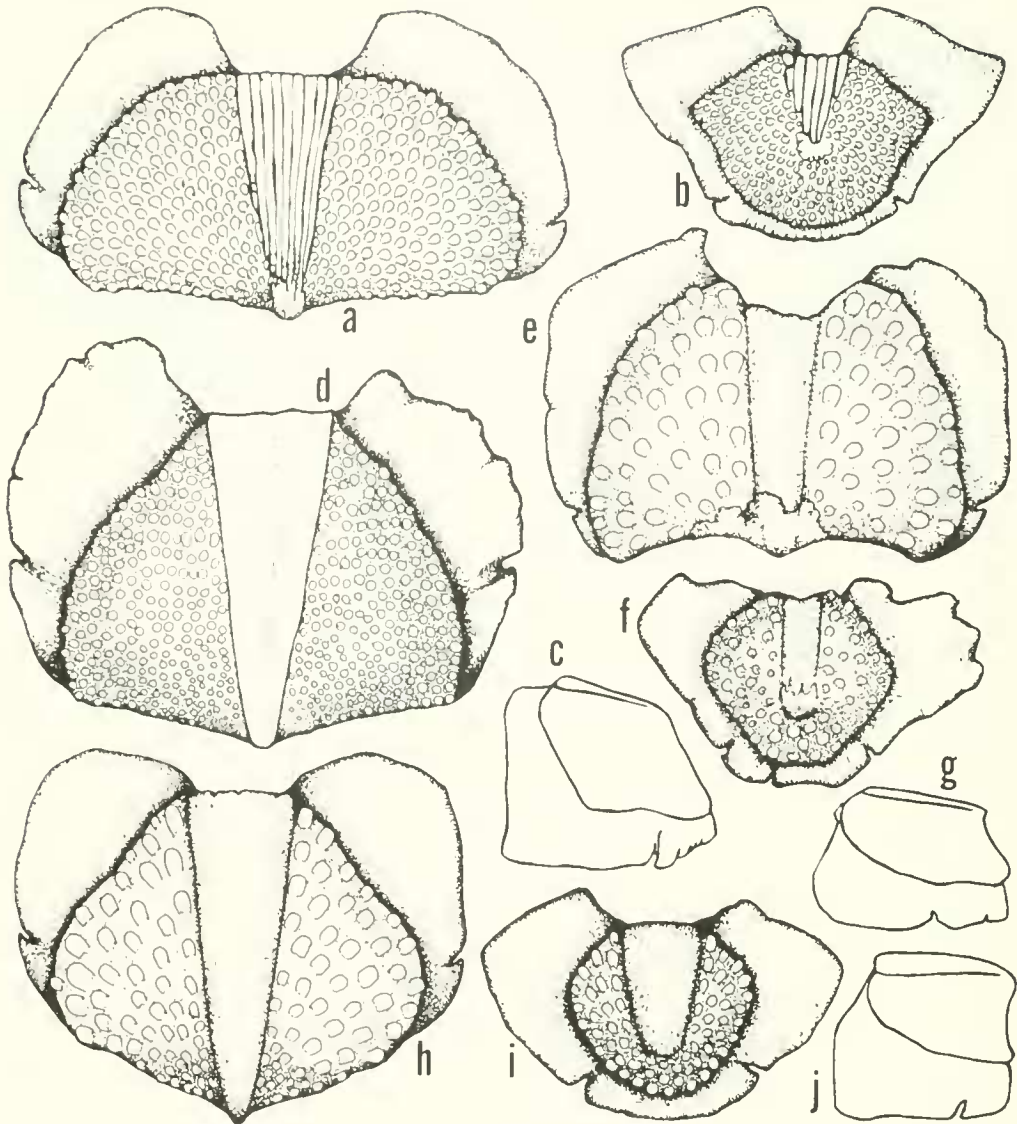


PLATE 2. Figs. a, b, and c: *Acanthochitona spiculosa* (Reeve, 1847), Watters collection, Windley Key, Florida. (a): valve VII, 2.8 mm diameter. (b): valve VIII, 1.9 mm diameter. (c): valve VIII, profile. Fig. d: *Acanthochitona astriger* (Reeve, 1847), Bullock collection, Maqueyes Island, La Parguera, Puerto Rico; valve VII, 3.3 mm diameter. Figs. e, f, and g: *Acanthochitona andersoni* new species, Paratype DMNH 95383, Picquet Rocks, B. m., Bahamas. (e): valve VII, 1.7 mm diameter. (f): valve VIII, 1.4 mm. (g): valve VIII, profile. Figs. h, i, and j: *Acanthochitona arragonites* (Carpenter, 1857), Watters collection, Bahía de Kino, Sonora, Mexico. (h): valve VII, 2.1 mm diameter. (i): valve VIII, 1.8 mm diameter. (j): valve VIII, profile.

pustule bears one macrosethe located towards the preputular edge. The 2-7 microsethes per pustule are directed generally to the preputular slope. Testaculum mottled brown, yellow, green, or amber; white; pustules may be col-

ored differently from the rest of the tegmentum. One paratype (DMNH 95383) is uniformly blackish-brown with occasional white pustules.

Apophyses moderately extensive. Slit formula 5-1-2, with interslits in some specimens.

Articulamentum translucent white, the color of the tegmentum showing through.

The entire girdle is velvety, armed with dense, bimorphic spicules on the dorsum. Both types are flattened in cross-section, bent, and smooth, but differ in size. Girdle variously colored green, white, dark-brown, tan, or mottled with these colors. Sutural tufts and marginal fringe well-developed but composed of only a few long, stout elements colored translucent white.

Type locality: Sta. 2, rocky cove, south shore of point, 1 km south of Calliaqua, St. Vincent, Lesser Antilles. *Holotype:* ANSP 332171. *Paratypes:* ANSP 220834 - 30 fathoms (54.6 m), on wreck, off Destin, Florida; ANSP 220833 - 30 fathoms (54.6 m), off Boynton Beach, Florida, Bales; Bullock collection - West Summerland Key, Florida; USNM 103424 - Key West, Florida, from U.S. Fish Commission; USNM 181248 - Key West, Florida, April 15-27, 1884; USNM 663398 - Key West, Florida, Weber; MCZ 204125 - Dry Tortugas, Florida, 1940, E. Koto; USNM 735327 - Sta. 52-60, on coral, center of Nichehabin Reef, East Allen Point, Ascension Bay, Quintana Roo, Mexico; Bredin - Smithson. Inst. Expedition, April 10, 1960, Rehder & Bousfield; USNM 736249 - Sta. 85 & 95, Suliman Point, Ascension Bay, Quintana Roo, Mexico; Bredin - Smithson. Inst. Expedition, April 17 & 19, 1960, Schmitt et al.; USNM 736058 - Ascension Bay, Quintana Roo, Mexico; Bredin - Smithson. Inst. Expedition; Bullock collection - Galeta Point, Canal Zone; ANSP 325808 - 1 mile west of Haulover, North Bimini, Bahamas; ANSP 325864 - 1 mile east of Turtle Rocks, southwest of concrete ship, 18 feet (5.4 m), Bimini, Bahamas, 1957-58, Robertson; DMNH 95383 - 10.6 m on *Strombus gigas*, Picquet Rocks, Bimini, April 17, 1973, Watters; MCZ 238906 - Goat Key, Andros Island, Bahamas, Patterson; MCZ 390 - Tobago Island, Clarke; Bullock collection - St. Jorisbaai, Curaçao.

Range: Subtidally to at least 55 m, from Quintana Roo to southeastern Florida and the Bahamas, the Lesser Antilles, and the Netherlands Antilles.

Remarks: This new species is not uncommon in collections but is often misidentified as other species, particularly as *A. pygmaea* (= *A. spiculosa*) and *A. balesae* Abbott, 1954. It is part of distinct complex containing *A. arragonites* (Carpenter, 1857) and *A. balesae*. The species of this complex are recognized by the vermiform body and convex, "D"-shaped pustules. All other New World *Acanthochitona* have concave, tear-drop-shaped or oval pustules.

Acanthochitona andersoni is closely related to *A. arragonites* (pl. 2h, i, j; pl. 4k), its cognate from the eastern Pacific, but can be differentiated by the dorsal girdle elements: in *A. andersoni* they are bimorphic, both types being flattened in cross-section, smooth, and bent, but of two distinct sizes; in *A. arragonites* they are monomorphic, round in cross-section, finely ribbed, and bent.

Acanthochitona balesae (pl. 3a, b, c; pl. 4j) differs from *A. andersoni* in having the dorsal elements monomorphic, flattened in cross-section, strongly ribbed, and bent. The pustules

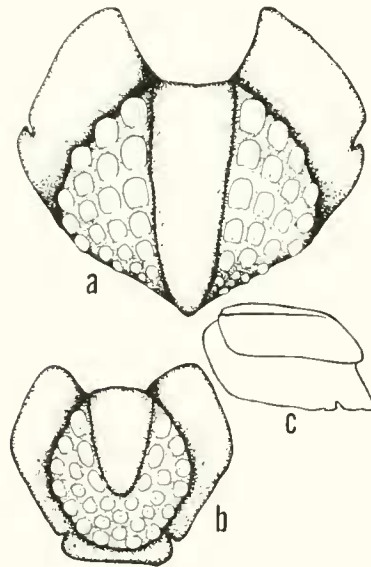


PLATE 3. Figs. a, b, and c: *Acanthochitona balesae* Abbott, 1954, Bullock collection, MaguYES Island, La Paragura, Puerto Rico. (a): valve III, 1.9 mm diameter. (b): valve VIII, 1.6 mm diameter. (c): valve VIII, profile.

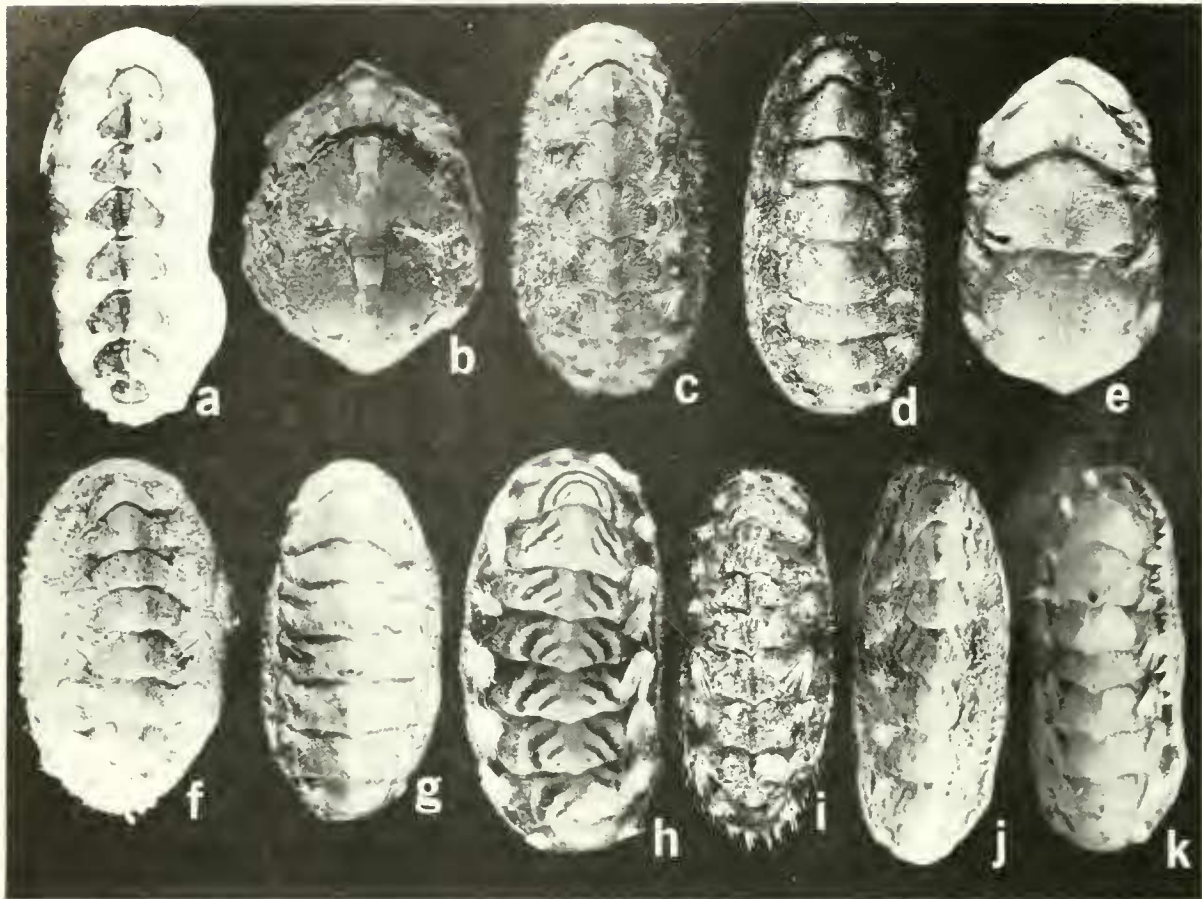


PLATE 4. (a): *Acanthochitona communis* (Rosso, 1826), Bullock collection, Azores Islands, 12 mm in length. (b): *Acanthochitona imperatrix* new species, Holotype USNM 218762, off San Diego, California, 8.9 mm in length, curled. (c): *Acanthochitona avicula* (Carpenter, 1864), Watters collection, Ensenada, Mexico, 15 mm in length. (d): *Acanthochitona avicula* (Carpenter, 1864), Lectotype of *A. avicula* variety *diegoensis* (Pilsbry, 1893), ANSP 349330, off San Diego, California, 19 mm in length. (e): *Acanthochitona angelica* Dall, 1919, Holotype USNM 110346, Bahía de Los Angeles, Baja California, Mexico, 11 mm in length, curled. (f): *Acanthochitona spiculosa* (Reeve, 1847), Watters collection, northwest West Summerland Key, Florida, 11 mm in length. (g): *Acanthochitona spiculosa* (Reeve, 1847), Lectotype of *A. pygmaea* (Pilsbry, 1893), ANSP 35783, Key West, Florida, 9 mm in length. (h): *Acanthochitona astriger* (Reeve, 1847), DMNH 45381, Water Island, Virgin Islands, 11 mm in length. (i): *Acanthochitona andersoni* new species, Holotype ANSP 332171, Calliagua, St. Vincent, 11 mm in length. (j): *Acanthochitona balesae* Abbott, 1954, USNM 535950, Bonefish Key, Florida, 10 mm in length. (k): *Acanthochitona arragonites* (Carpenter, 1857), Watters collection, Salinas, Ecuador, 4 mm in length.

of the intermediate valves of *A. arragonites* and *A. andersoni* tend to radiate from the beak: in *A. balesae* they are parallel to the jugum. Examination of museum collections has shown that *A. balesae* is widely distributed in the Caribbean and is more curled than was previously realized. Known as *A. verticosa* and *A. elongata* (both 1972) are other species. The lectotype of *A.*

balesae, herein designated is ANSP 349331 from Bonefish Key, Florida.

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The latter species is named in honor of Mr. Burton Anderson of Hollywood, Florida, who introduced me to malacology.

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WHAT IS *VENERICARDIA MORSEI* DALL?

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While I was preparing my review of the north-west American Carditidae, I examined the type material of *Venericardia (Cyclocardia) morsei* Dall, 1918: 234, described from "Sagami, Japan." The type material (USNM 274075), in contrast, is labeled as coming from another locality, "Kii, Japan." I concluded that, of eastern Pacific species, *V. (C.) morsei* was

closest to but separable from *Cyclocardia crebricostata* (Krause, 1885) (Coan, 1977: 379).

Habe (1978: 99-100; figs. 5-8) has recently expressed the view that the type material of *Venericardia morsei*, which he illustrates for the first time, is conspecific with *Cyclocardia crassidens* (Broderip & Sowerby, 1829), a species characteristic of the eastern Pacific, par-